

# Measurement of an excited charmonium state and the study of $J/\psi$ polarization in PHENIX experiment at RHIC

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Determining the  $J/\psi$  polarization will provide a constraint on charmonium formation mechanisms. Measuring the feed down of the  $\psi'$  to the  $J/\psi$  is important for understanding prompt  $J/\psi$  production as well as the anomalous suppression observed in AA collisions at RHIC. The PHENIX Collaboration has studied charmonium production in  $p+p$  collisions at RHIC using the sample collected during the 2006 data taking period through its decays into the di-electron channel at mid rapidity. This high statistics data set allows us to study polarization of the  $J/\psi$  and the  $\psi'$  to  $J/\psi$  ratio at RHIC energies.